

EX-800

SERIES

USERS MANUAL

EX-801
EX-820

AXIOM

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1.

INTRODUCTION

The AXIOM EX-800 series are self-contained 120 line per minute printers which can be interfaced directly with parallel or serial (RS232C or 20mA current loop) input codes from a computer system or other data source. The printers are small and quiet and have been designed to require a minimum of maintenance. They are simple for a non-technical person to operate.

There are four basic printers in the EX-800 series, the EX-800 and EX-810 (covered in separate manuals) and the EX-801 and EX-820 which are covered in this manual.

EX-801 MicroPrinter

The EX-801 MicroPrinter is available in three different models depending on the type and speed of data input required.

The EX-801P is equipped with a "Centronics" type parallel ASCII input as standard. This unit includes upper/lower case characters, low paper detector, bell, built-in self test routine, variable character size, case and power supply - in other words the EX-801P is a complete 80-column stand alone line printer ready to connect to any 7 or 8 bit parallel output port on a microcomputer.

The EX-801S contains all the features of the EX-801P MicroPrinter but with RS232C/20mA serial input (switch-selectable from 50 to 1200 baud) in addition to parallel ASCII. For baud rates higher than 1200, the EX-801HS is needed.

The EX-801HS has a high speed serial input with switch selection of 15 baud rates from 50 to 9600 baud, otherwise it is identical to the EX-801S. It accepts both RS232C and 20mA current loop inputs.

All EX-801 models have a 256 character multi-line input buffer which is particularly useful for serial data transmission, where the size of the buffer reduces the short term likelihood of lost data or timeouts.

EX-820 MicroPlotter

In addition to all the features of the EX-801S MicroPrinter (i.e. parallel ASCII and serial RS232C/20mA current loop inputs, upper/lower case printout, variable character size, etc.), the EX-820 has one unique feature - it does graphics. The EX-820 has a high resolution graphic software package built in to the Intel 8048 controller allowing the user to format graphical images with resolutions up to 128 dots per inch. Standard input buffer on the EX-820 is increased to 512 characters. Serial input to 1200 baud is built in as standard.

Before powering-up a new machine for the first time, check that all setting-up procedures have been correctly followed (section 2-2).

ELECTROSENSITIVE PRINTING METHOD:

Electrosensitive paper is manufactured with an aluminized electrically conducting surface over a colored coating. A current pulse to the paper will burn off the top surface to expose the dark coating underneath. Dot matrix characters are made up by selectively supplying current pulses through 8 fine wires in the printhead which are in light contact with the paper as the printhead moves across.

PRINCIPLE OF OPERATION:

The electronic interface is controlled by a microprocessor system which interprets the input codes it receives as characters or control signals, and stores them in its buffer memory. As soon as a complete line has been stored or a print command received, the print cycle is initiated. This begins with turning on the motor, together with the feed and print solenoids. A cam is then engaged in the helical drive shaft, moving the printhead across the paper. While the printhead is making this traverse, the microprocessor sends out electrical pulses to it such that the pattern of dots formed on the paper makes up the characters to be printed on that line.

The microprocessor shares its time between reading in new data and organizing the printing of each line so that the buffer can be filling up with new data at the same time as spaces are being emptied by the printing of the previous line.

The interface normally accepts parallel transmission of ASCII signals with acknowledged and busy signals being sent back to the data source. All models also contain RS232C and 20mA current loop inputs as standard for serial data transmission at rates up to 1200 baud. An optional circuit board provides serial input with switch-selectable baud rates from 50 to 9,600.

OPERATOR CHECK LIST2-1 UNPACKING:

Inspect the packing carton for signs of excessive mistreatment. If any damage is found on receipt of the printer, the package should be kept, to assist in making a claim against the carrier.

Each carton should contain a printer complete with line cord and a paper roll inserted and a copy of the users manual.

CAUTION: All units are shipped completely assembled, but the user should not plug in the line cord or turn on the power until the following checks have been made:

2-2 SETTING UP:

2-2.1 Important - Check these items before connecting line cord to AC outlet.

- A. Check the voltage setting: Printers are normally supplied set-up for 115V AC @ 60 Hz, but if the user's power source is different or the printer has a selectable range, then the user should confirm that the setting agrees with his power source.
- B. Fuse (in back panel) is 1/2A slo-blo for 100-125 V AC,
1/4A slo-blo for 220-240 V AC.
- C. Check the loading of the paper (section 2-2.5). Remove all packing from around the paper roll before attempting to load paper.
- D. Input signal connection. The input signals will be brought through a cable and plug to the multi-pin receptacle on the back panel. Make sure these connectors are firmly joined. Signal characteristics and pin designations are given in section 4.

After these setting-up procedures, the printer may be turned on.

2-2.2 ON/OFF SWITCH: Is a rocker switch on the back panel. The printer motor should come on for a moment after the switch is turned on.

2-2.3 OFF LINE SWITCH: Is an alternate action push button switch which, when depressed, will prevent the printer from accepting or printing out further incoming data. At the moment that the off-line switch is depressed, the unprinted contents of the line buffer will be lost.

2-2.4 SELF TEST SWITCH: Is a push button alternate action switch which, when depressed, will cause the printer to cycle through an internal routine generating ASCII characters in sequence in the absence of incoming data. The size and set of characters printed during the test routine will depend on the exact mode of operation that the printer is in when the test is activated.

The printer will only respond to the Test feature when it is in an off-line condition.

2-2.5 PAPER FEED: Is a momentary action push button switch used to run out a length of paper. It may be used at any time to insert extra space into a printed message without loss of incoming data.

2-2.6 PAPER LOADING: May be performed without disconnecting power.

- a. Open paper lid, exposing old paper roll tube. Brief instructions for paper loading are printed inside this lid.
- b. Remove old paper tube by gently depressing the retaining tabs in the side walls of the paper cavity. Remove plastic core from old paper roll tube.
- c. Insert core into new paper roll so that it is centrally located. Drop paper roll into the paper cavity in the printer case so that the sensitive (aluminized) side of the paper faces downwards as it is brought forward to the printer mechanism. The paper roll should rotate freely on the central core which should be securely clamped by the retaining tabs.
- d. Tear or cut the paper diagonally with the point at the left, removing any torn or badly creased length of paper.
- e. Pull paper release lever forward, and guide the paper down the slot immediately behind the print block.
- f. The paper should reappear under the plexiglass screen. Feed through until the full width of paper is running freely, then let go of the paper release lever. Push the paper feed button for a few automatic paper feeds before replacing the top cover.
- g. LOWER PAPER LID - Otherwise the printer will register paper low and will not operate.

2-2.7 PAPER TEAR-OFF: The paper may be torn off by pulling diagonally forward, across the cutting edge to the front panel or top cover. Check that the most recently printed line is visible above the plexiglass screen before tearing off the message. The programmer can also insert two or more extra linefeeds to separate messages and bring the last line above the tear-off point.

CAUTION: If the paper appears not to have torn off cleanly, or if there is any doubt that the paper is running freely, then test with several paper feeds, and if necessary reload the paper. Improper loading of the paper is the most common cause of service problems and possible damage to the printhead.

3-1.1 ACCESS TO THE PRINTHEAD: The printhead is exposed when the upper half of the case is **NOT PRINTING?**

CAUTION: **DON'T FORGET TO CLOSE THE PAPER LID.** when making any mechanical adjustments.

Sent wires can sometimes be repaired using fine tweezers or a flat blade, but they are very brittle and it is usually better to replace the printhead.

3-1.2 DAMAGED PLATEN (PRINT BLOCK): Remove paper and wipe off any foreign material. If platen is scored it can be smoothed with fine sandpaper such as supplied with new printhead.

3-1.3 OTHER ADJUSTMENTS TO PRINTHEAD: As if mounting a new printhead.

3-1.4 REPLACEMENT OF PRINTHEAD: The printhead assembly consists of fine printing wires mounted in a small plastic head, a flat flexible cable and an edge connector which makes contact with the circuit board under the mechanism.

- a. Remove the knurled plastic printhead retaining screw to free the printhead, and pull the edge connector forward, off the circuit board.
- b. Mount the new printhead by reversing this procedure. Before tightening the plastic retaining screw, adjust the head so that the wires make uniform contact with the platen.
- c. Load fresh paper if necessary, and test the adjustment of the head by turning on the power and printing a line (most conveniently by using the self-test button on the front panel).
- d. If the printing is uneven (top or bottom dots barely visible), loosen the printhead retaining screw slightly and gently press the front or back of the printhead as required to rotate the print wires into parallel alignment with the print block.

3.

MAINTENANCE

3-1 PRINthead MAINTENANCE: The printhead should last for between one and two million lines of printing (70-140 rolls of paper). Missing rows of dots, or smudged or excessively faint characters indicate that the printhead needs readjustment or replacement.

3-1.1 ACCESS TO THE PRINthead: The printhead is exposed when the upper half of the case is removed as described in section 3-2.

CAUTION: The AC power should be disconnected before making any mechanical adjustments.

Bent wires can sometimes be repaired using fine tweezers or a flat blade, but they are very brittle and it is usually better to replace the printhead.

3-1.2 DAMAGED PLATEN (PRINT BLOCK): Remove paper and wipe off any foreign material. If platen is scored it can be smoothed with fine sandpaper such as supplied with new printhead.

3-1.3 OTHER ADJUSTMENTS TO PRINthead: As if mounting a new printhead.

3-1.4 REPLACEMENT OF PRINthead: The printhead assembly consists of fine printing wires mounted in a small plastic head, a flat flexible cable and an edge connector which makes contact with the circuit board under the mechanism.

- a. Remove the knurled plastic printhead retaining screw to free the printhead, and pull the edge connector forward, off the circuit board.
- b. Mount the new printhead by reversing this procedure. Before tightening the plastic retaining screw, adjust the head so that the wires make uniform contact with the platen.
- c. Load fresh paper if necessary, and test the adjustment of the head by turning on the power and printing a line (most conveniently by using the self-test button on the front panel).
- d. If the printing is uneven (top or bottom dots barely visible), loosen the printhead retaining screw slightly and gently press the front or back of the printhead as required to rotate the print wires into parallel alignment with the print block.

Occasionally a new printhead will require "bedding down" before even printout is obtained. This may be rapidly achieved by inserting the small strip of fine sandpaper (supplied with each printhead) into the paper guide at the surface of the print block. Gently pass the printhead once or twice across the sandpaper by hand to remove any irregularities and fully "bed down" the new print wires.

Note: The printer should be turned off while making this adjustment. Once printing uniformly, the head should stay in adjustment for its lifetime.

The case may now be closed and the printer put back into operation.

3-2 REMOVAL OF THE CASE: First remove the paper from the mechanism. The paper roll may be left in place in its cavity in the upper half of the case. Now remove the three screws holding the upper cover to the base. There are two screws at the back of the base. The cover should now lift off as a unit exposing the mechanism and electronics.

Note: The power should be disconnected before removing the cover, since electrical connections will be exposed. Subsequent electrical tests should only be performed by a qualified technician.

The printer is equipped with a safety interlock which will not allow printing to take place when the cover is removed. For service by a qualified technician, this interlock may be defeated by grounding the forward cover retaining screw.

3-3 50/60 Hz OPERATION: Whenever reassembling the printer, check the position of the rubber drive belt connecting the motor to the helical drive shaft. There are two sets of pulleys, the inner ones (nearer to motor) are for 60 Hz operation, the outer for 50 Hz. Wrong placement will produce incorrect printing speed and character size.

3-4 STORAGE: If the printer is to be stored for an extended time, make sure that there is paper in place through the paper advance mechanism. A dessicant should be packed with the printer in a closed polyethylene bag.

3-5 SELF TEST: The self-test button located on the front panel is an alternate action push-button switch which, when latched, causes a test pattern to be printed out in the absence of any incoming data. This provides a useful check on the correct operation of most of the printer functions, but does not guarantee that the printer is working correctly in all situations. (See section 7 - Troubleshooting). The sample below shows the test printout from a printer set for 80 columns and upper case only.

./0123456789:;<=>@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_

The self-test feature will only operate when the printer is in an off-line condition - AND THE PAPER LID IS CLOSED.

3-6 CLEANING AND LUBRICATION OF MECHANISM: Cleaning and lubrication should be performed approximately every million lines of printing (70 rolls of paper). Clean only with alcohol. Lubricate points as indicated in Appendix A-8.

Note: The ball bearings at each end of the helical drive shaft should not be lubricated, nor should the guide rails or the ground return roller surfaces. All other moving parts or cam mating surfaces should be lubricated, using only Losoid 33.

4-1 PRINTING SPEED AND DATA ACCEPTANCE RATE: The FX-501 and FX-510 mechanism requires approximately one-half second to print a line or to perform a linefeed, regardless of the number of characters printed. Thus the data source must transmit data at a rate of 160 alphanumeric characters and the printer will take one second to convert either message into the appropriate hardcopy. The ring buffer, which stores control commands as well as characters, can smooth out this data acceptance rate; but, of course, cannot overcome the long-term limit of two lines per second printing speed.

Two reverse channel signals - Acknowledge or Busy (for parallel data input) and Data Terminal Ready (for serial transmissions with RS option) can be used to limit the data source to acceptable transmission rates. Use of the reverse channel optimizes the system throughput by filling the buffer very rapidly so that there is always at least one complete line in the buffer when the mechanism is ready to begin a print cycle. Once the Buffer is filled, new storage locations are made available at the rate that the buffer is emptied by printing, characterizing or performing control functions.

4-2 AUTOPRINT: As soon as a complete line has been received, printing will be initiated when the next character is received whether or not this character is LF.

The number of characters per line is selectable as 80, 40, or 20 and the character size is in a corresponding 1:2:4 ratio. Autoprint will be initiated when 80, 40, or 20 characters have been received in the appropriate fixed format, or a number proportional to their size when character sizes are mixed on a single line. As an example 10 large characters (each taking 4 spaces) + 10 medium (2 spaces) + 20 small (single space) will activate the autoprint feature.

4-3 PRINTING OPTIONS: Various printing characteristics may be selected by plugging in or removing jumpers on the circuit board. As an example, the printer could be limited to 40 columns and upper case characters only (if the user was not able to modify the signal source to select these characteristics by input data command).

INTERFACE DETAILS AND SIGNAL CONNECTIONS

4-1 PRINTING SPEED AND DATA ACCEPTANCE RATE: The EX-801 and EX-820 mechanism requires approximately one-half second to print a line or to perform a linefeed, regardless of the number of characters printed. Thus the data source might transmit either two linefeeds or 160 alphanumeric characters and the printer would take one second to convert either message into the appropriate hardcopy. The ring buffer, which stores control commands as well as characters, can smooth out this data acceptance rate; but, of course, cannot overcome the long-term limit of two lines per second printing speed.

The reverse channel signals - Acknowledge or Busy (for parallel data input) and Data Terminal Ready (for serial transmissions with HS option) can be used to limit the data source to acceptable transmission rates. Use of the reverse channel optimizes the system throughput by filling the buffer very rapidly so that there is always at least one complete line in the buffer when the mechanism is ready to begin a print cycle. Once the buffer is filled, new storage locations are made available at the rate that the buffer is emptied by printing characters or performing control functions.

4-2 AUTOPRINT: As soon as a complete line has been received, printing will be initiated when the next character is received whether or not this character is LF.

The number of characters per line is selectable as 80, 40, or 20 and the character size is in a corresponding 1:2:4; ratio. Autoprint will be initiated when 80, 40, or 20 characters have been received in the appropriate fixed format, or a number proportioned to their size when character sizes are mixed on a single line. As an example 10 large characters (each taking 4 spaces) + 10 medium (2 spaces) + 20 small (single space) will activate the autoprint feature.

4-3 PRINTING OPTIONS: Various printing characteristics may be selected by plugging in or removing jumpers on the circuit board. As an example, the printer could be limited to 40 columns and upper case characters only (if the user was not able to modify the signal source to select these characteristics by input data command).

The basic printing characteristics are determined by the positions of jumpers J1 through J8 on the printer control card. The jumper positions are shown on the component layout (Appendix A-2). Access to the circuit board is as described in the section on maintenance, (3-2).

J1 and J2 - Character Size: Jumpers J1 and J2 determine the start-up character size of the printout regardless of J3.

Start-Up Character Size	J1	J2
80	Short	Short
40	Open	Short
27	Short	Open
20	Open	Open

Note: If jumper J3 is open then printout will remain in the preset character size regardless of software commands.

J3 - Response to Software Commands: If jumper J3 is shorted then the printer will respond to the ASCII control characters, SI, SO, GS, RS, US and FS. If J3 is open then printout will be unaffected by any of these characters.

Sections 4-4 through 4-8 summarize the uses of these special control characters.

J4 - Parallel or Serial Input:

EX-801P	J4 must always be shorted.
EX-801S	J4 open (as shipped) - printer accepts RS232C or 20mA current loop inputs up to 1200 baud as described in section 4-10. J4 shorted - printer accepts parallel ASCII data as described in section 4-9.
EX-801HS	J4 must always be shorted when HS card is in place. Printer accepts RS232C/20mA inputs up to 9600 baud as described in section 4-11. Without an HS card fitted, printer acts like the EX-801S above but will not accept parallel data.
EX-820	J4 shorted (as shipped) - printer accepts parallel ASCII or graphic data as described in section 4-9. J4 open - printer accepts RS232C or 20mA current loop inputs up to 1200 baud as described in section 4-10.
EX-820HS	J4 must always be shorted when HS card is in place. Printer accepts RS232C/20mA inputs up to 9600 baud as described in section 4-11.

J5 - Serial Byte Length:

EX-801P, Setting of J5 is irrelevant.
EX-801HS

EX-801S, If J4 is shorted (parallel ASCII input) then the
EX-820 setting of J5 is irrelevant.

If J4 is open (serial input) then J5 sets the
byte length as follows:

J5 shorted - printer will accept a serial in-
put with a byte length of 8-bits. This is nec-
essary for graphic input to an EX-820 or when
using an expanded character set with an EX-801
or EX-820.

J5 open - printer accepts a serial input byte
of 7-bits.

Note: When J5 is set for 8 data bits and graphic or expanded char-
acter set operation is not being used, the 8th bit must be sent as
a SPACE otherwise the printer will not function (it tries to look
for an expanded character set which does not exist). If the data
source cannot be modified to send bit 8 as a SPACE, then set jumper
J5 open (7 bits) even though 8 data bits are transmitted.

J6 Character Set: If J6 is shorted then the full 96 character
ASCII set is printed.

If J6 is open then the printed character set is restricted to the
64-character ASCII set (upper case only).

J7 - Input Buffer Size: J7 is factory preset according to the size
of the input buffer option on the printer.

For an EX-820 model, which has 512 characters as standard or for an
EX-801 with the B512 option, then J7 is always shorted.

J7 is open on all standard EX-801 models with a 256 character input
buffer.

J8 - External Memory: With any of the options involving external
memory, B2K (for 2K character input buffer), M2K PROM memory (ex-
ternal program memory for users software) or C128 (expanded char-
acter set) then jumper 8 should be shorted.

All standard units are supplied with jumper 8 open.

The following table serves as a handy reference for the configur-
ation of J1 through J8.

JUMPER	SHORT	OPEN	COMMENTS
J1, J2	J1, J2	-	Sets 80 column at start-up.
	J2	J1	Sets 40 column at start-up.
	J1	J2	Sets 27 column at start-up.
	-	J1, J2	Sets 20 column at start-up.
J3	Variable	Fixed	Fixed format does not respond to any ASCII control characters except LF.
J4	Parallel	Serial	EX-801P, EX-801HS, EX-820HS: J4 always shorted.
J5	8-bits	7-bits	Sets serial byte length when J4 is open (EX-801S, EX-820 only). Irrelevant when J4 is shorted (for EX-801P or EX-801HS).
J6	U/L case	U/only	Sets 96 or 64 character ASCII set.
J7	512 buffer	256 buffer	Sets input buffer size. Must be set for 512 is B2K option is used.
J8	External memory	Standard	Must be set for external memory if M2K, B2K or C128 options are used.

4-4 SOFTWARE CONTROL OF MIXED CHARACTER SIZE: When the mixed character size format is selected, extra ASCII codes are recognized by the interface.

<u>FUNCTION</u>	<u>ASCII</u>	<u>BINARY</u>	<u>OCTAL</u>	<u>HEX</u>	<u>MANY KEYBOARDS</u>
Change to 80 col	GS	001 1101	035	1D	Control]
Change to 40 col	RS	001 1110	036	1E	Control ^
Change to 20 col	US	001 1111	037	1F	Control -

Power-on will select 80 columns format, and receipt of either "change to 40 col" or "change to 20 column" code will select that format until overridden by a subsequent "change to..." code. In formatting a layout the line may be thought of as having 80 spaces, where a 20 column character fills 4 spaces, a 40 column character fills 2 and an 80 column character fills one space. Autoprint will cause the line to print when 80 or more of these spaces are filled.

4-5 LINEFEED (NEWLINE): Terminates a line and causes it to be printed out. When J3 is open, this is the only ASCII control character recognized by the controller.

<u>FUNCTION</u>	<u>ASCII</u>	<u>BINARY</u>	<u>OCTAL</u>	<u>HEX</u>	<u>MANY KEYBOARDS</u>
Linefeed or print	LF	000 1010	012	0A	Control J

4-6 BELL:

<u>FUNCTION</u>	<u>ASCII</u>	<u>BINARY</u>	<u>OCTAL</u>	<u>HEX</u>	<u>MANY KEYBOARDS</u>
Sound buzzer	BEL	000 0111	007	07	Control G

4-7 REVERSE PRINTING: The SI/SO commands cause the printout to be reversed whereby characters or graphic data are printed light against a dark background.

<u>FUNCTION</u>	<u>ASCII</u>	<u>BINARY</u>	<u>OCTAL</u>	<u>HEX</u>	<u>MANY KEYBOARDS</u>
Start reverse printout	SI	000 1111	017	0F	Control O
Stop reverse printout	SO	000 1110	016	0E	Control N

Note: The reverse printout feature may be used to plot histograms by printing a number of ASCII "spaces" bracketed by SI/SO commands. This will cause a solid dark bar to be printed of length proportional to the number of spaces and the character size selected.

4-8 GRAPHICS ON THE EX-820: ASCII control character FS character commands the EX-820 to immediately enter a graphic mode.

<u>FUNCTION</u>	<u>ASCII</u>	<u>BINARY</u>	<u>OCTAL</u>	<u>HEX</u>	<u>MANY KEYBOARDS</u>
Start graphic "field"	FS	001 1100	034	1C	Control \

The byte following FS will be interpreted by the EX-820 as a number of graphics "bytes" (expressed in binary) that will be transmitted by the user. The user must then transmit this number of bytes before the EX-820 will return automatically to a printing mode where it recognizes data input as ASCII characters. This command may be used as many times as required on a single line to intermix graphic and alphanumeric printout.

For a full explanation of the graphic mode of operation, see Section 5.

4-9 PARALLEL INTERFACE INPUT SIGNALS & TIMING: EX-801P - A "Centronics" type parallel ASCII input is supplied as standard.

The EX-801S and EX-820 models contain "dual-purpose" interfaces which may be selected for parallel ASCII input (with similar signals and timing to the EX-801P but with a different connector and pin-out) or as serial RS232C/20mA current loop inputs at rates up to 1200 baud.

Selection of basic parallel or serial operation for the EX-801S/EX-820 is via jumper J4 and 10-position DIL switch S2 on the printer control card (locations are shown in Appendix A-2). Refer to section 4-9.2 to set parallel operation and to section 4-10.1 to set serial operation.

Note: The EX-820 is shipped from the factory set up for parallel ASCII/graphics input. The EX-801S is set for serial RS232C.

4-9.1 SIGNAL LEVELS: All inputs can be driven by low power TTL.
All outputs have fan-out of 5 TTL loads.

4-9.2 SETTING EX-801S/EX-820 FOR PARALLEL DATA INPUT:

1. Check jumper J4 is shorted.
2. Open ALL switches on 10-position DIL switch (S2).

Note: If only 7 lines of ASCII are driven by the data source (Data Bit 1 through Data Bit 7) then S2-8 (Bit 8) may be closed. BEWARE, however, if Bit 8 is subsequently connected to a data source it will short-circuit to ground if S2-8 is closed.

4-9.3 PARALLEL INPUT CONNECTIONS:

<u>SIGNAL</u>	<u>EX-801P</u> (36-pin ribbon connector)	<u>EX-820/801S</u> (DB-25S connector)	<u>DESCRIPTION</u>
<u>STR</u>	1	10	Negative going pulse of width greater than 500ns, leading edge latches data. Data must be valid 100 nsec before and after leading edge of strobe.
Data bit 1	2	15	LSB EX-801P is shipped with Data 8 grounded through jumper J9 (Appendix A-2). Input ASCII codes on Data 1-7. EX-801S/820 may be grounded for 7 bit parallel ASCII. See 4-9.2 above. MSB
Data bit 2	3	16	
Data bit 3	4	17	
Data bit 4	5	18	
Data bit 5	6	19	
Data bit 6	7	21	
Data bit 7	8	23	
Data bit 8	9	24	
<u>ACK</u>	10	25	Negative going pulse of fixed duration 12.5 μ sec follows the trailing edge of STR by a variable delay fo 10 to 15 μ sec. When buffer is full, ACK is delayed by up to 500 msec until BSY goes low.
<u>Busy</u>	11	14	TTL high level when the printer buffer is full or when the short-term data acceptance rate (approximately 500 μ sec per character) is exceeded - any further data sent when BSY is high will be lost. Follows within 40 nsec of the leading edge of STR. Delay a minimum of 30 μ sec after BSY goes low before transmitting new data.

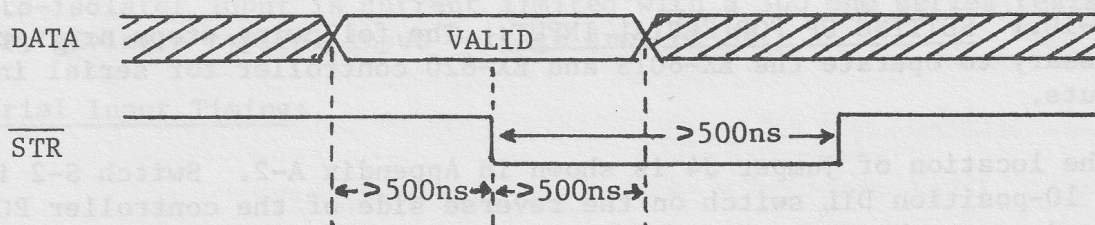
(continued on next page)

4-9.3 cont.

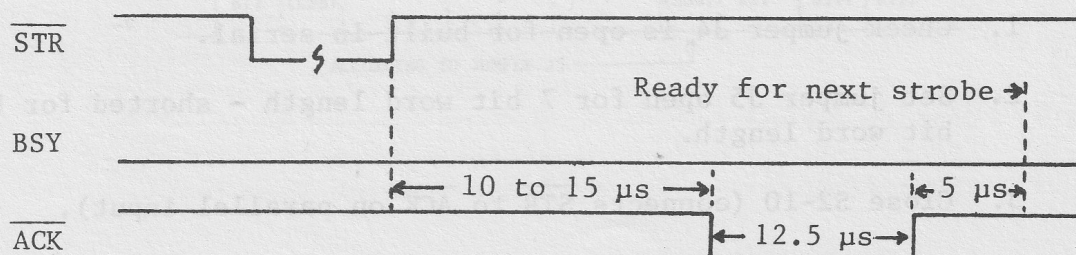
SIGNAL	EX-801P (36-pin ribbon connector)	EX-820/801S (DB-25 connector)	DESCRIPTION
Offline	12	NA	TTL high level when printer is off line.
SLCT	13	NA	TTL high permanently.
Ground	14	NA	Ground.
-	15	-	NC
Ø V	16	1	Chassis ground.
Chassis ground	17	1	Chassis ground.
+5V	18	13	+5V @ 250mA output.
Twisted pair ground	19-29	7	Signal ground.
Ground	30	NA	Ground.
-	31	-	NC
FAULT	32	NA	TTL high permanently.
Ground	33	NA	Ground.
-	34-36	NA	NC

4-9.4 INPUT TIMING (Not to scale):

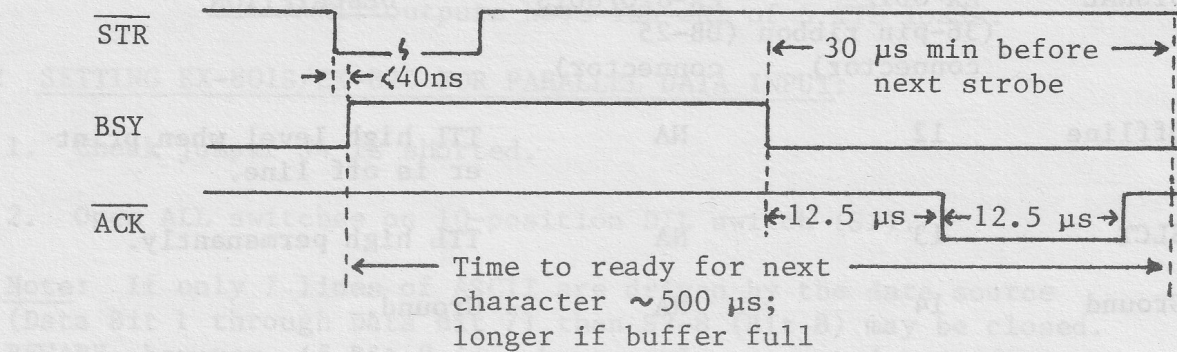
A. Strobe Timing



B. Normal input timing when buffer is not full and when short-term data acceptance rate is not exceeded.



- C. Input timing if buffer is full or if input data rate exceeds 1900 cps.



4-10 EX-801S and EX-820 SERIAL INPUT: The standard controller supplied with EX-801S and EX-820 printers contains both serial RS232C and 20mA current loop inputs.

Eight common baud rates up to and including 1200 baud can be preset by programming the 10-position DIL switch S2 on the controller PC card.

At all baud rates up to and including 1200 baud, the printer can keep up with a continuous data transmission providing full lines of data are always sent. If there are many short lines or line feeds transmitted, then data will backup in the input buffer. The EX-801S and EX-820 are equipped with large input buffers which will overcome most short-term variations between the incoming data rate and the basic printout rate of two lines per second.

If baud rates higher than 1200 are needed, or if a reverse channel RS232C signal is required to throttle incoming data when the input buffer is full, then option HS must be used which increases baud rate capability to 9,600 and provides a full RS232C input configuration.

Alternatively, option B2K gives a 2048 character buffer which can hold an entire CRT screen of information, so that an overrun signal is unnecessary.

4-10.1 SETTING UP FOR SERIAL INPUT: The following steps are necessary to operate the EX-801S and EX-820 controller for serial inputs.

The location of jumper J4 is shown in Appendix A-2. Switch S-2 is a 10-position DIL switch on the reverse side of the controller PC card, near the input connector.

RS232C SIGNAL

1. Check jumper J4 is open for built-in serial.
2. Set jumper J5 open for 7 bit word length - shorted for 8 bit word length.
3. Close S2-10 (connects $\overline{\text{STR}}$ to $\overline{\text{ACK}}$ on parallel input).

4-10.1 cont.

4. Set baud rate on S2-1 through S2-8 according to table in section 4-10.4.
5. Open S2-9 for RS232C operation.
6. Input data on pin 3 (signal) and pin 7 (ground).

20mA CURRENT LOOP SIGNAL

1. Follow steps 1 to 4 above.
2. Close S2-9 for 20mA current loop operation.
3. Input data on pin 8 (-20mA) and pin 9 (+20mA).

Note: The EX-801S is shipped from the factory preset for serial RS232C operation and 7 bit word length. Only the baud rate should need to be set, however, it is a good idea to use the above as a check list.

The EX-820 is shipped set for parallel input.

4-10.2 SIGNAL LEVELS AND TIMING:

RS232C:

Mark = binary 1 = -23V to -3V = (-V or OFF).

Space = binary 0 = +3V to +25V = (+V or ON).

Open circuit or 300 ohms to ground on input = mark.

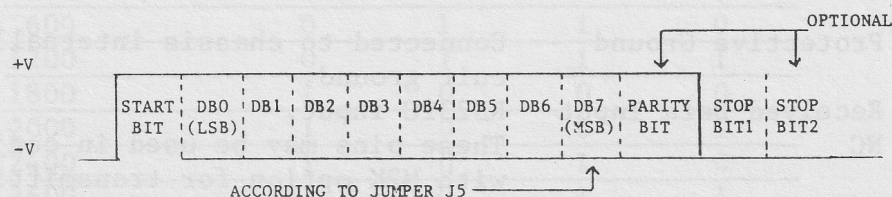
20mA Current Loop:

Mark = binary 1 = 20mA current flowing.

Space = binary 0 = No current flowing - open circuit.

Opto-isolator input is current limited with a 300 ohm series resistor, giving a typical input voltage drop of 5V.

Serial Input Timing:



4-10.3 SERIAL TRANSMISSION FORMAT: The controller is permanently set for 1 Stop Bit and No Parity in the serial input mode. With this configuration, the controller will accept all variations of parity and/or number-of-stop-bits without affecting the validity of incoming data.

The byte length for incoming data should be set by jumper J5.

Note: The HS option allows full selection of Parity and Number-of-Stop-Bits.

4-10.4 SETTING THE BAUD RATE: The following table shows how the parallel ASCII input should be programmed with switch S2 to set the controller for different baud rates between 50 and 1200. The program setting is read by the controller only at power-on. Subsequent changes of program setting will not affect the baud rate setting unless the printer is turned off and then on again.

BAUD RATE		SWITCH POSITION							
S2-Switch no.	(HEX)	8	7	6	5	4	3	2	1
50	06	0	0	0	0	0	1	1	0
72	53	0	1	0	1	0	0	1	1
110	8F	1	0	0	0	1	1	1	1
134.5	A4	1	0	1	0	0	1	0	0
150	AD	1	0	1	0	1	1	0	1
300	D7	1	1	0	1	0	1	1	1
600	EC	1	1	1	0	1	1	0	0
1200	F6	1	1	1	1	0	1	1	0

1 = open

0 = closed

Note: Early models of the EX-801/820 require that these connections are made on the input "D" connector or on the controller PCB (Appendix A-2).

4-11 EX-801HS and EX-820HS SERIAL INPUT:

4-11.1 INPUT CONNECTION (Back Panel "D" Connector):

Pin 1	Protective Ground	Connected to chassis internally to circuit ground.
Pin 3	Received Data Input	RS232C input.
Pin 2, 4, 5	NC	These pins may be used in conjunction with M2K option for transmitting serial data.
Pin 7	Circuit Ground.	
Pin 8	-20mA (input)	Negative current loop input.
Pin 9	+20mA (input)	Positive current loop input.

(continued on next page)

4-11.1 cont.

Pin 13 +5V @ 250mA For external use.
Pin 20 Buffer Overrun Signal of +V changes to -V.

WARNING: Other pins on the DB input connector may have internal signals preset and should not be connected to user's data sources.

Note: Early models of EX-801HS (below serial numbers 1000 on the HS PC card) have opposite polarity for overrun signal on pin 20. All other models are supplied as indicated on preceeding page but with a jumper J101 on HS PC card to reverse polarity if desired.

4-11.2 SIGNAL LEVELS:

As for EX-801S and EX-820 (serial input) see Section 4-10.2.

4-11.3 SELECTING RS232C or 20mA CURRENT LOOP INPUT:

All units are supplied set for RS232C as standard.

To convert to 20mA current loop input, connect the RS232C data input (Pin 3 on the back panel "D" connector) to +5V (Pin 13). Pins 8 and 9 can then be used respectively as - and + 20mA current loop inputs. Some EX-801HS/820HS units may have a 10-position switch (S2) on the controller PC on the opposite side to the input connector.

4-11.4 BAUD RATE SELECTION:

Input baud rates are selected on an 8-position DIL switch (S101) on the HS option PC card.

Open = 1 (Hi)
Closed = 0 (Lo)

SWITCH #				
BAUD RATE	5	6	7	8
50	0	0	0	0
72	0	0	0	1
110	0	0	1	0
134.5	0	0	1	1
150	0	1	0	0
300	0	1	0	1
600	0	1	1	0
1200	0	1	1	1
1800	1	0	0	0
2000	1	0	0	1
2400	1	0	1	0
3600	1	0	1	1
4800	1	1	0	0
7200	1	1	0	1
9600	1	1	1	0

4-11.5 BYTE FORMAT:

Selected as follows on the 8-position DIL switch (S101) on the HS option PC card:

<u>SWITCH NO.</u>	<u>Open (=Hi=1)</u>	<u>Closed (=Lo=0)</u>
1	No parity	Parity as selected by switch 4.
2	2 stop bits	1 stop bit
3	8 data bits	7 data bits
4	Even parity	Odd parity

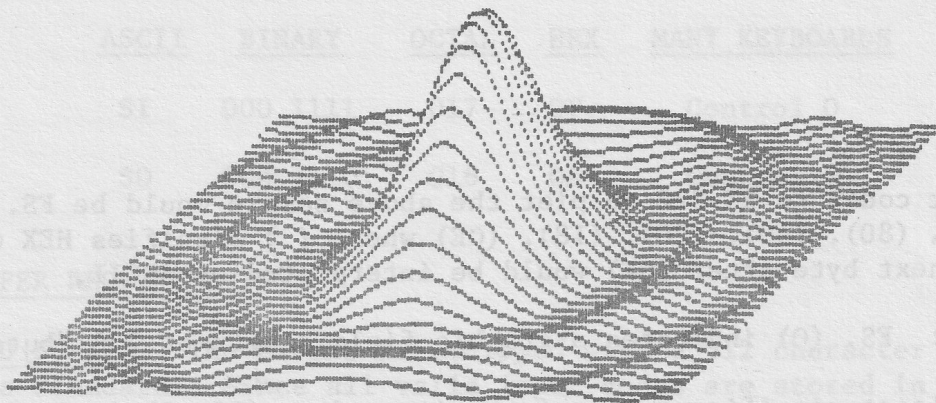
5.

GRAPHICS

5-1 GRAPHICS ON THE EX-820: The EX-820 MicroPlotter is capable of mixing high resolution graphics with ASCII alphanumeric characters on a dot by dot, character by character or line by line basis, under software control. All graphical and alphanumeric data may be input to the EX-820 in 8-bit parallel or RS232C/20mA serial format.

This is a unique and powerful feature of the EX-820 and gives the user greater flexibility in plotting curves and outlines, as well as logos and almost any special characters. The EX-820 can even be used to plot musical scores.

INTRODUCING THE **AXIOM EX-820** ELECTROSENSITIVE PRINTER



GRAPHICS SUPPLIED BY APPLE COMPUTER AND SOFTWARE

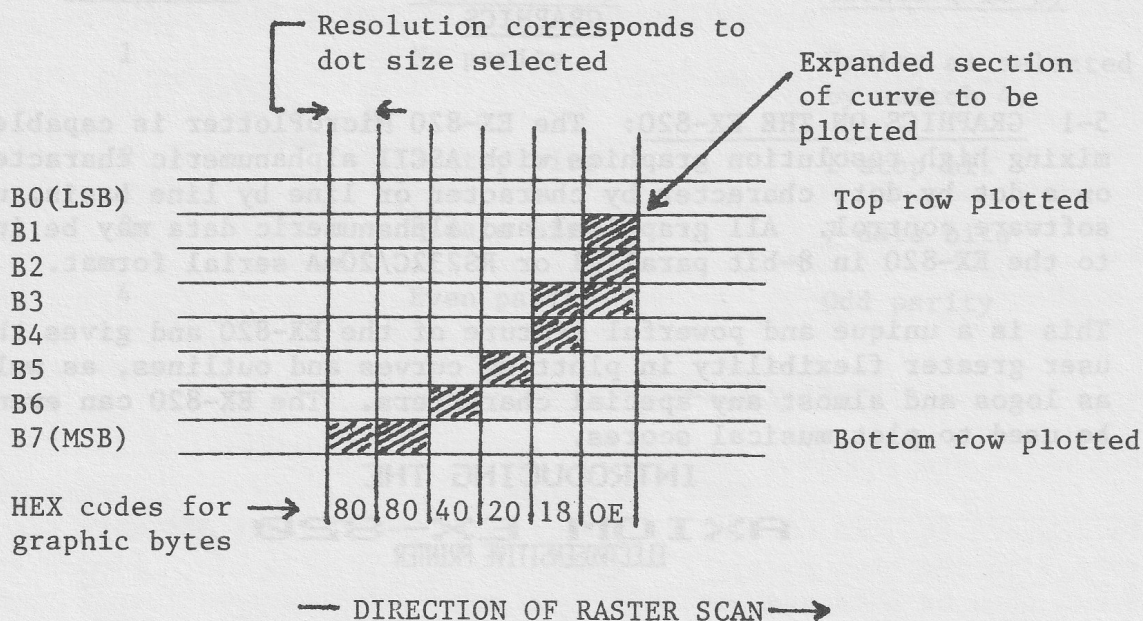
EX-820 sample output

5-2 GRAPHIC FIELDS: When the EX-820 is first powered-up, it behaves exactly like an EX-801 line printer. All incoming codes are interpreted as ASCII characters and will be printed out or acted upon accordingly. However, once the EX-820 is sent the ASCII code FS, then it immediately enters the "Graphic" mode of operation.

The instruction to enter the graphic mode is really a 2-byte instruction FS. (N), where (N) is an 8-bit byte representing a binary number from 0 to 255 which specifies the length of a graphic "field". Upon receipt of the instructions FS. (N), the EX-820 will interpret the next N bytes of input data as successive vertical 8-dot columns

5-2 cont.

of a horizontal raster scan. The following diagram shows how part of the graphical image is formed from such a raster scan.



Input codes to EX-820 to plot the above sample would be FS. (06). (80). (80). (40). (20). (18). (0E) where () signifies HEX codes. The next byte after (0E) would be interpreted as ASCII.

Note: FS. (0) indicates a graphic field length of 256 "bytes".

The least significant bit of the input data (Bit 0) is interpreted as the top row of dots in the raster scan. The most significant bit (Bit 7) corresponds to the bottom row of dots.

Within the limitation of the input buffer (see section 5.4), the user may specify an unlimited number of graphic "fields" on each printed line. Printout must be initiated while in the alphanumeric ASCII printing mode by a LF command. When this is received, the EX-820 will immediately "dump" the contents of its input buffer on to the paper.

Note: The Autoprint feature is completely nullified when graphic data is sent to the EX-820, so that printout must always be initiated by the LF command. The input buffer will continue to read in and store fresh data for successive lines of output while printing out the previous line, whether this contained the graphic data or not.

5-3 DOT CHARACTERISTICS:

5-3.1 DOT SIZE: The dot size of the graphical output can be controlled by the ASCII control characters GS, RS and US, which are normally used to specify character size (see section 4-4). If these codes are used immediately prior to sending the FS.(N) commands to enter the graphic mode then the graphical output will be in the dot size specified; otherwise dot size will correspond to the previous ASCII character size.

<u>FUNCTION</u>	<u>ASCII</u>	<u>BINARY</u>	<u>OCTAL</u>	<u>HEX</u>	<u>MANY KEYBOARDS</u>
Change to 512 dot resolution	GS	001 1101	035	1D	Control \sqcap
Change to 256 dot resolution	RS	001 1110	036	1E	Control \wedge
Change to 128 dot resolution	US	001 1111	037	1F	Control -

5-3.2 REVERSE GRAPHICS: The SI/SO commands used to control reverse printout, (see section 4-7) also apply to printing reverse graphics. If the SI code is used immediately prior to entering the graphic mode then all subsequent graphical output will be printed as complimentary data (i.e. having dots replaced by spaces and spaces replaced by dots).

<u>FUNCTION</u>	<u>ASCII</u>	<u>BINARY</u>	<u>OCTAL</u>	<u>HEX</u>	<u>MANY KEYBOARDS</u>
Start reverse graphics	SI	000 1111	017	0F	Control O
Stop reverse graphics	SO	000 1110	016	0E	Control N

5-4 INPUT BUFFER REQUIREMENTS:

5-4.1 STANDARD BUFFER: The EX-820 is equipped with a 512 character input buffer as standard. Since all valid input codes are stored in the buffer prior to printing out, this effectively limits the maximum length of a graphic field on a single line to 507 bytes. This is because 5 buffer locations are used to store the codes FS. (N1), FS. (N2), and LF. In this case, the sum of N1 and N2 would be 507. If such a line of data was sent to an EX-820 then the buffer would remain completely full until printout commenced, giving a "dead" period of up to 140 nsec between initiating printout and the print-head reaching the left hand margin, during which no further input data would be accepted. This is only a problem during serial transmissions.

This limitation on the number of horizontal locations for graphical output is only of concern if no ASCII characters are to be printed out on the same line as the graphical data, and if the smallest dot size is selected. Each ASCII character corresponds to 6 1/2 horizontal graphic "byte" locations so that even one ASCII character on a line will reduce the buffer requirement for graphical data to 506 bytes while still giving full 512 dot horizontal resolution.

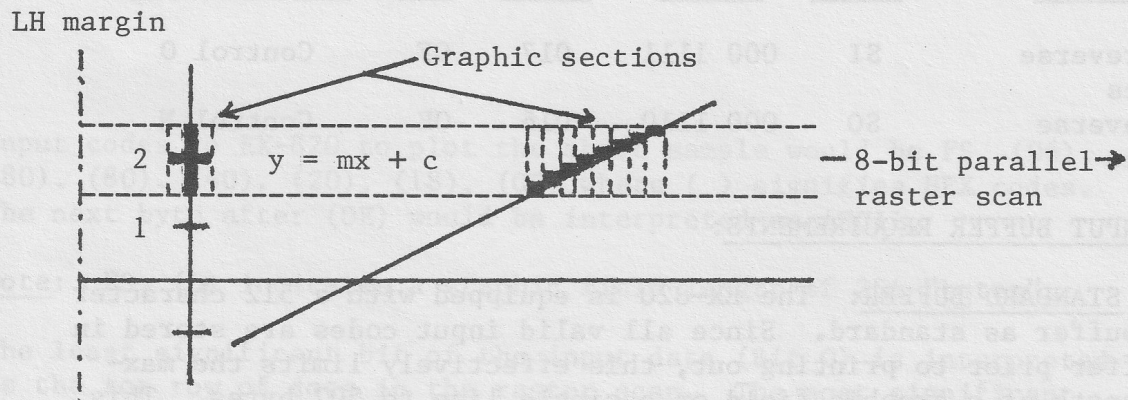
5-4.2 OPERATION WITH 2K BYTE INPUT BUFFER OPTION: None of the above considerations apply when the EX-820 is equipped with the B2K option which expands the input buffer to 2K bytes. In this case there is ample room for full 512 dot graphics without any ASCII alphanumeric data mixed in. In fact, the EX-820 will physically print out 520 dots horizontally on each line before reaching the right hand margin when the smallest dot size is selected. With the B2K buffer option this full capability may be used.

5-5 MIXING GRAPHICS AND ALPHANUMERICS:

1. The 3 software selectable dot sizes are in a 1:2:4 ratio, (GS: RS: US).
2. Alphanumeric characters count $6\frac{1}{2}$ horizontal graphic bytes or the corresponding dot resolution.
For example, ONE 20-column character counts -

6 $\frac{1}{2}$ dots at 128 dot resolution
13 dots at 256 dot resolution
26 dots at 512 dot resolution

The following simple example shows how alphanumeric and graphic data are mixed in drawing a labelled curve.



Input codes to plot section of curve and labels between dotted lines would be -

SP.2.FS.(03).(08).(FF).(08).SP.y.=.m.x.+c.SP.FS.(08).(08).
(40).(20).(10).(08).(04).(02).(01).LF

where () signifies a HEX code.

Note: To simplify registration of graphical output, keep separate counts of alphanumeric characters and graphic bytes whenever possible. Arrange for alphanumeric fields between vertically aligned graphic outputs on successive line to contain an even number of ASCII characters. This will insure that the vertical alignment of the graphics is not misplaced by a one-half dot spacing.

ADD-ON OPTIONS

6-1 MICROPROGRAM: The microprogram stored in the Intel 8048 microprocessor controls all printer and graphic functions on the EX-801 and the EX-820.

The resident software package in the Intel 8048 is "modular". This gives great flexibility to the printer operating system and allows a number of sophisticated options, including the ability to interpret and modify incoming data, to be added on to the EX-801 or EX-820 by a simple expansion of the data bus.

These options are fully described in individual data sheets supplied when the option is purchased. The following sections are intended to serve as a brief introduction.

6-2 OPTION B2K - CHARACTER INPUT BUFFER: When the B2K option is added, the multi-line asynchronous input buffer is expanded to 2048 characters. This option is particularly useful in two situations:

1. When a complete line of graphic output, containing no ASCII alphanumeric characters, is to be printed with 512 dot horizontal resolution. In this case, the 2K input buffer allows a full line of 512 graphic bytes to be stored together with appropriate control characters before printout and also allows uninterrupted transmission of serial data.
2. When a fast screen "dump" from a CRT terminal is required. A complete 1920 character screen may be transmitted to a printer with the M2K option fitted in less than one second.

6-3 OPTION C128 - EXPANDED CHARACTER SET: Since the EX-801 and EX-820 both allow 8-bit input codes, a total of 256 different codes can be recognized (HEX 00 to FF). These input codes are split into two subsets, according to whether the most significant bit is "0" (codes 00 to 7E in HEX) or whether it is "1" (80 to FF in HEX). Locations 00 to 7E are reserved for the normal ASCII character set, including control characters. On standard machines, without the expanded character set, the MSB must always be "0", except in the graphic mode of operation.

The C128 options allows a user-defined character set to be placed in the input code locations 80 to FF. The option is supplied with a 2758 UV erasable PROM containing the software package necessary to interact with the software in the basic 8048 controller as well

6-3 cont.

as blank locations corresponding to input codes 80 to FF in which the user may store up to 128 characters on a 5 X 8 dot matrix.

If the user does not have the ability to program a 2758 PROM then AXIOM can supply this service to user's specifications for a nominal one-time charge.

6-4 OPTION M2K - USER PROGRAM MEMORY: This is an extremely powerful option which allows the user to modify or format all incoming data to his own specifications. With this option in place, program control is automatically transferred to a 2716 UV Erasable PROM when the printer is turned on. The PROM contains an operating system for interacting with the basic software package in the 8048 controller. When this package is resident, approximately 1.5k bytes are left unused for user programs.

Typical applications for the EX-801 or EX-820 with the M2K option include POS terminals, Electronic Scales or any use requiring manipulation and presentation of incoming data.

As an example, an electronic weighing system might consist of a transducer with binary output and an EX-801 printer. The EX-801 would accept the binary output from the transducer, linearize and convert to pounds and ounces from a preprogrammed calibration table. It would then print out the weight in pounds and ounces together with a Logo and identifying message. This entire sequence of operations could be triggered from a single input from the transducer.

The C128 and M2K options may be combined to give the user the greatest possible flexibility in formatting input data and the output of printed characters to his own specifications.

The M2K option also provides the capability for a reverse channel whereby the printer may communicate in serial or parallel with the data source or with another data terminal. Provision is made on the HS option (high speed serial interface) for reverse channel RS232C signals to be sent on pin 2 (Transmitted Data) of the DB25 connector at the rear of the printer, under control of the program resident in the M2K memory.

There are many strict timing requirements during printing and plotting which must be observed when using the M2K option. Refer to the individual M2K data sheets for further information.

6-5 OPTION HS - HIGH SPEED SERIAL INTERFACE: The standard versions of the EX-801 and EX-820 contain RS232C/20mA serial inputs as well as parallel ASCII inputs. However, the serial input rate is limited to a maximum of 1200 baud. If higher baud rates (up to 9600) are required then option HS must be attached. This provides switch-selection of 15 standard baud rates from 50 to 9600 together with selection of parity and number-of-stop-bits.

TROUBLESHOOTING

This section is intended to provide guidelines for locating and rectifying the majority of simple faults which may develop on EX-801 and EX-820 printers. It is not intended, nor is it recommended, that any repairs be attempted to the Intel 8048 controller PC board. All faults of this type should be referred to the nearest AXIOM service center.

7-1 POOR QUALITY PRINTOUT: Most printout quality problems can be traced to badly loaded or torn paper or lack of printhead maintenance. Always load paper carefully, check that it is free of wrinkles or tears and that it moves freely (use paper advance button). If printout quality starts to deteriorate, locate and rectify the fault as soon as possible.

FAULT	PROBABLE CAUSES/REMEDIES
Uneven, irregular or smudged printout. No consistency.	<ol style="list-style-type: none"> 1. Printhead clogged. Remove and clean. 2. Worn printhead. Replace as described in section 3-1.
Missing row of dots.	<ol style="list-style-type: none"> 1. Burned out drive circuit. Replace U1 if missing row is in the top half of character. U2 if in bottom half (Appendix A-2). 2. Broken wire in printhead (visible on close inspection). Replace printhead as described in section 3-1. 3. Printhead misaligned. Most likely when top or bottom row is missing. Loosen knurled printhead retaining screw (0135) and realign, (see section 3-1).
Excessive background "Striping".	<ol style="list-style-type: none"> 1. Printhead misaligned. Realign as described in section 3-1. 2. New printhead needs bedding down. Follow section 3-1. 3. When accompanied by mis-shapen characters, indicates damaged print wires. Replace printhead as described in section 3-1. 4. Damaged platen (07140 print block). Replace.

FAULT	PROBABLE CAUSES/REMEDIES
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Adjacent rows of dots always print identically.	Short circuit in printhead or driver circuitry. Remove controller PCB and check resistance between terminals on connector J1 (see Appendix A-2). If shorted, then fault is in printhead. Remove printhead, clean both ends and, if necessary, replace. If open, then fault is in controller PCB. Check U1 and U2 at input and output stages. (Appendix A-2,3).
---	--

Uneven character widths or vertical misalignment of graphics.	<ol style="list-style-type: none"> 1. Clean and, if necessary, replace rubber drive belt (02310). 2. Clean guide rails (07120) with alcohol. These must be dry and completely free of grease. 3. Clean rubber damper (07130) with a moist cloth. 4. If none of the above measures has any effect, then replace print carriage and guide rail assemblies as a unit.
---	--

Uneven vertical spacing between lines.	<ol style="list-style-type: none"> 1. Excess tension in paper path. Check paper roll is correctly mounted and that it rotates freely. 2. Worn ratchet wheel (04170). Replace
--	--

7-2 NO PRINTOUT AT ALL:

FAULT	PROBABLE CAUSES/REMEDIES
-------	--------------------------

Printer accepts data until buffer is full. Motor turns on. Buzzer sounds. Self-test inoperative.	<ol style="list-style-type: none"> 1. Out of paper. Reload. 2. Paper lid not closed. Printer "thinks" it is out of paper.
--	---

Printer accepts data until buffer is full. Motor turns on and single linefeed is performed. No buzzer. Self-test inoperative.	<ol style="list-style-type: none"> 1. Print solenoid (0605A) jammed or inoperative. Check that mechanism is clear. Also check driver circuit (Appendix A-2,3).
---	---

FAULT	PROBABLE CAUSES/REMEDIES
Printer accepts data until buffer is full. Motor turns on and single "click" is heard. No linefeed. No buzzer. Self-test inoperative.	Paper advance solenoid (0390A) jammed or inoperative. Check that mechanism is clear. Also check driver circuit (Appendix A-2,3).

No data accepted. No buzzer. Self-test works.	<ol style="list-style-type: none"> 1. Printer off line. 2. Jumpers set for wrong type of input—i.e. (serial instead of parallel or vice-versa) see section 4-3. 3. Data source not transmitting. 4. Baud rate setting completely wrong. 5. Faulty controller. Return complete printer for service.
---	---

No printout. No data accepted. No buzzer. Self-test inoperative	<ol style="list-style-type: none"> 1. Fuse blown or printer not turned on. 2. Self-test does not operate when printer is on line. Take printer off line and recheck. 3. Return complete printer for service.
---	---

7-3 GARBLED PRINTOUT: Most faults involving "garbled" printout can be traced to incorrect baud rate settings or wrongly wired input connections. It is very helpful to compare the difference between transmitted and printed data with the ASCII character table (Appendix A-1). This often pinpoints any "jammed" data bits.

FAULT	PROBABLE CAUSES/REMEDIES
Printer operates normally in all respects except that printout is garbled. Self-test works correctly.	<ol style="list-style-type: none"> 1. Marginally wrong baud rate setting. 2. Input timing marginal. Check against minimum requirements in section 4. 3. Data source at fault (wrong baud rate, output connections etc.). 4. Input connector wrongly wired. See section 4. 5. Return complete printer for service. Before doing this, double check all of the above possibilities. Most printers that are returned for this fault do not, in fact, have anything wrong with them.

Printer operates normally in all respects except that occasional characters are missed or printed wrongly.	<ol style="list-style-type: none"> 1. Incorrect use of BSY or DTR (with HSS option) signal to throttle serial data source. Check timing requirements of transmitter inhibit signal. 2. In parallel input mode, data source does not wait full 30 usec after BSY goes low before sending next character. Increase delay time.
--	--

MOST SIGNIFICANT BITS

		0	1	2	3	4	5	6	7	
L E A S T S I G N I F I C A N T B I T S	0	NUL	DLE	SP	0	@	P	\	p	0
	1	SOH	DC1	!	1	A	Q	a	q	1
	2	STX	DC2	"	2	B	R	b	r	2
	3	ETX	DC3	#	3	C	S	c	s	3
	4	EOT	DC4	\$	4	D	T	d	t	4
	5	ENQ	NAK	%	5	E	U	e	u	5
	6	ACK	SYN	&	6	F	V	f	v	6
	7	BEL	ETB	'	7	G	W	g	w	7
	8	BS	CAN	(	8	H	X	h	x	8
	9	HT	EM	)	9	I	Y	i	y	9
	A	LF	SUB	*	:	J	Z	j	z	A
	B	VT	ESC	+	;	K	[	k	{	B
	C	FF	FS	,	<	L	\	l	!	C
	D	CR	GS	-	=	M	]	m	}	D
	E	SO	RS	.	>	N	^	n	~	E
	F	SI	US	/	?	O	_	o	DEL	F

Note: EX-801/820 will "accept" all of the above codes, but only responds to those outlined (e.g. **LF**)

BEL : Ring Bell

LF : New Line

SO : Start Normal Printing

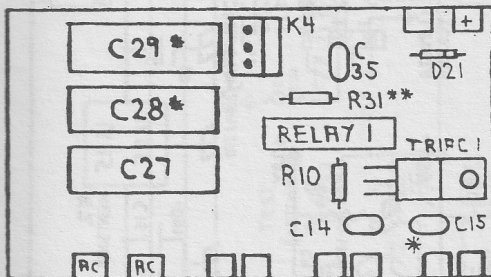
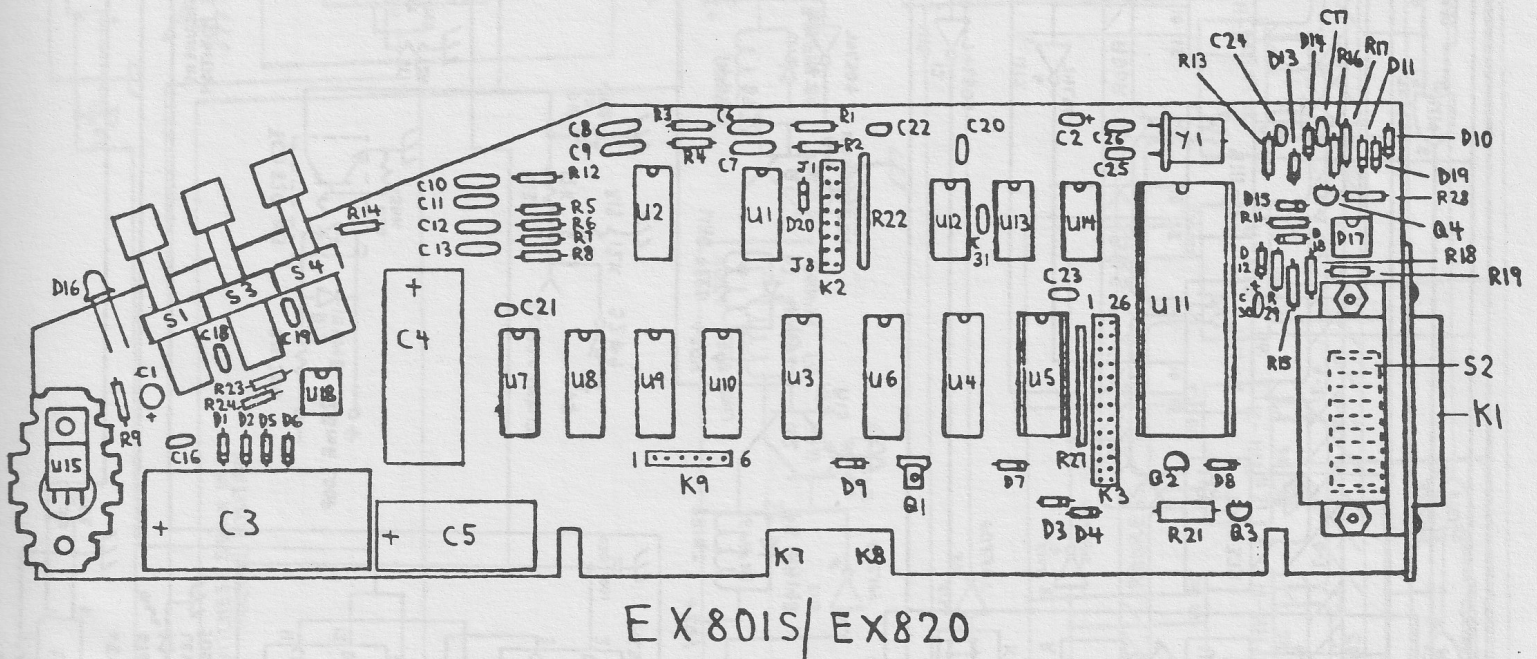
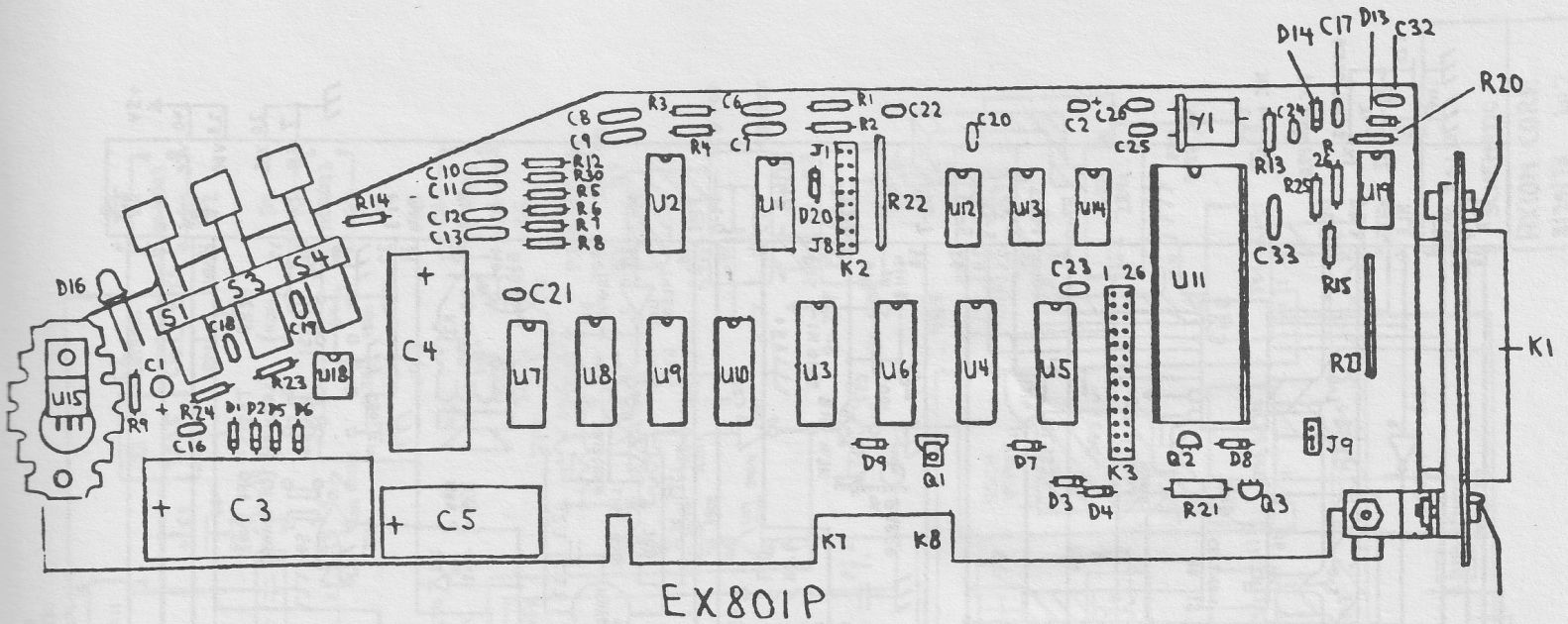
SI : Start Reverse Printing

FS : Enter Graphics Mode

GS : Start 80 Column Print

RS : Start 40 Column Print

US : Start 20 Column Print

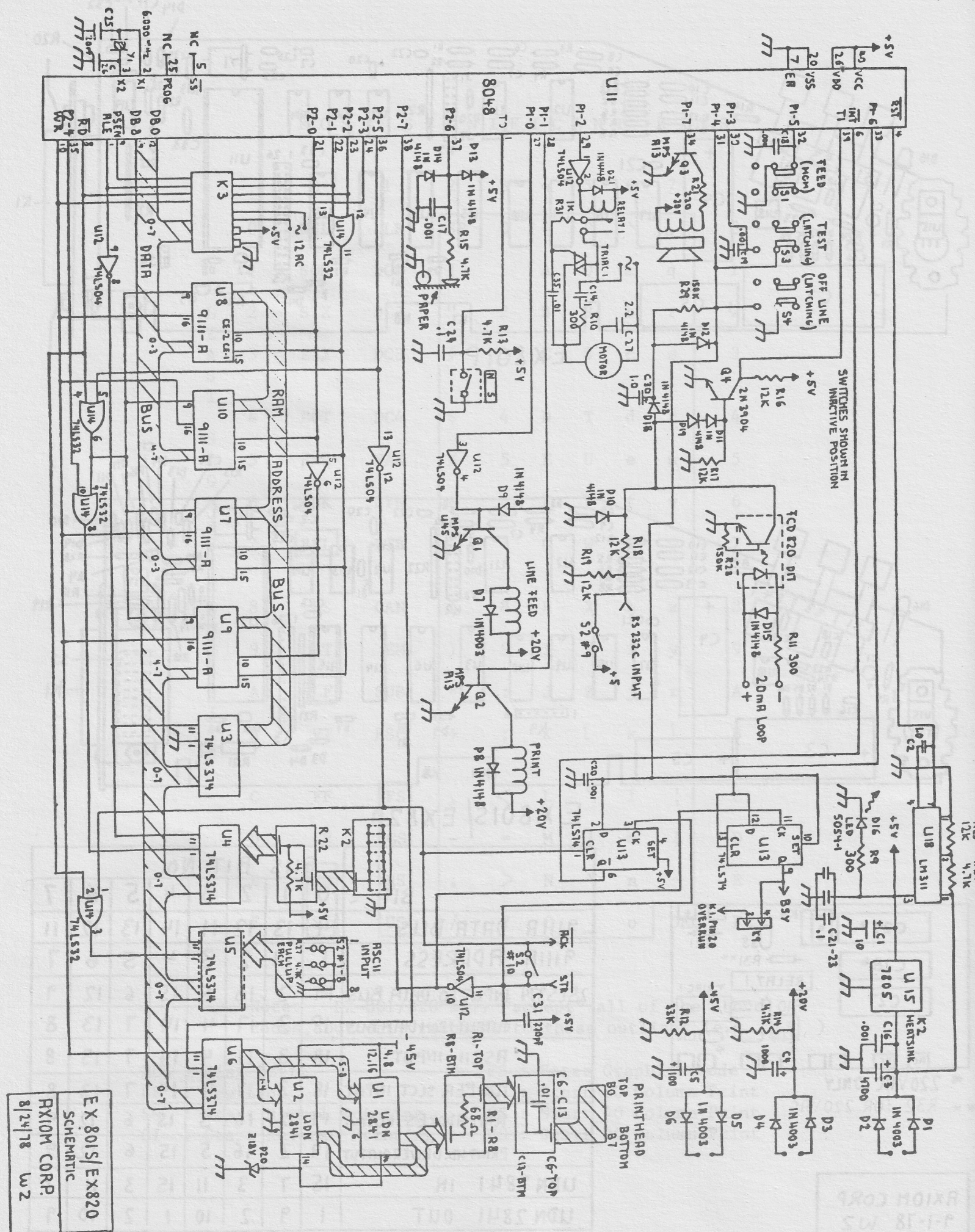


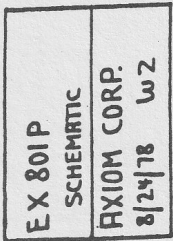
* 220VAC ONLY

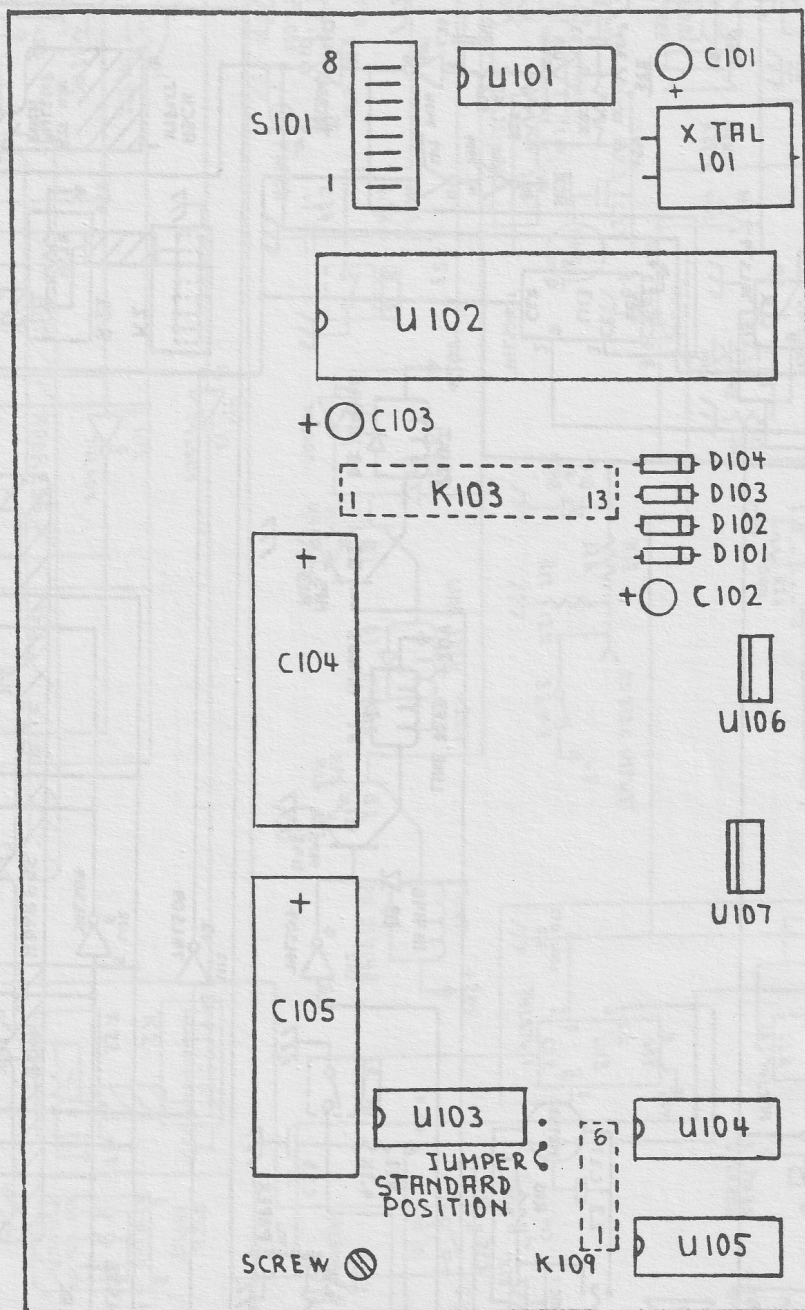
** R32 FOR 220VAC

AXIOM CORP
9-1-78 W2

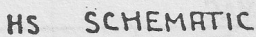
BIT	BUS BIT No.							
	0	1	2	3	4	5	6	7
9111A DATA BUS	14	13	12	11	14	13	12	11
9111A ADDRESS	1	17	2	3	4	5	6	7
25LS374 INPUT TO DATA BUS	19	2	16	5	15	6	12	9
OUTPUT FROM DATA BUS	18	3	17	4	14	7	13	8
ASCII INPUT	18	3	17	4	14	7	13	8
JUMPER SLCT. INPUT	18	3	17	4	14	7	13	8
RAM ADDRESS OUTPUT	19	2	16	5	15	6	12	9
PRINT HD. DRIVER OUTPUT	19	2	16	5	15	6	12	9
UDN 2841 IN	15	7	3	11	15	3	11	7
UDN 2841 OUT	1	9	2	10	1	2	10	9







HS
COMPONENT LAYOUT
AXIOM CORP.
1-5-79 WZ



ELECTRONIC PARTS LIST

EX-801P & EX-801S

P C BOARD ASSEMBLY

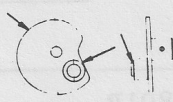
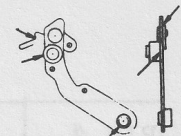

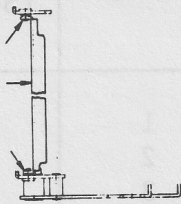

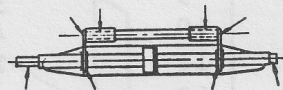

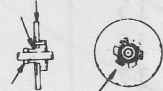
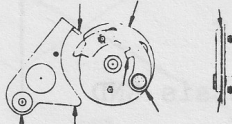
PART NO.	QTY P	QTY S	DESCRIPTION	PART NO.	QTY P	QTY S	DESCRIPTION
1000-102	2		Resistor 1K 1/4 W 5%	1300	4	10	Diode 1N4148
1000-123	1	5	Resistor 12K 1/4 W 5%	1301	7	7	Diode 1N4003
1000-154		2	Resistor 150K 1/4 W 5%	1305	1	1	LED 5054-1
1000-301	1	2	Resistor 300 1/4 W 5%	1308		1	Opto Isolator FCD 820
1000-333	1	1	Resistor 33K 1/4 W 5%	1309	1	1	Zener Diode IN967
1000-472	4	4	Resistor 4.7K 1/4 W 5%	1351	1	1	Crystal 6.000 MHz
1000-680	10	8	Resistor 68 1/4 W 5%	1379		1	Switch 10 Position
1001-221	1	1	Resistor 220 1/2 W 5%	1444		1	Socket .20 Pin
1002-472	2	2	Resistor 4.7K S.I.L.	1447	1		Hardware Conn. Mtg.
1021		1	Cap. 220pF Mon Cer	1450	1X16	1X16	Conn. 16 Pin DIL
1023	4	4	Cap. .001uF Cer Disk	1450	1X26	1X26	Conn. 26 Pin DIL
1024	8	8	Cap. .01uF Poly	1452	1X3		Conn. 3 Pin SIL
1029	1	1	Cap. 10uF 16V Tant	1452		6	Pin 6x1 Row
1031	1	2	Cap. 1uF 35V Tant	1482		1	Conn. DB25S
1032	1	1	Cap. 1000uF 25V Electr	1484	3	3	Button Cap
1041	1	1	Cap. 100uF 100V Electr	1485	1	1	40 Pin Socket DIP
1046	2	2	Cap. 20pF Cer Disk	1488	2	2	Switch - Locking
1049	1	1	Cap. 4700uF 16V Electr	1490	1	1	Switch - Non Locking
1050	4	4	Cap. .1uF 50 Mon Cer	1497	1		Hardware, Conn. Mtg.
1052	1		Cap. 30pF Cer Disk	1499	1		Conn. 36 Pin
1053	1		Cap. .002uF Poly	1512		2	Washer
1109	1		IC 7414	1552		2	Threaded Spacer
1121	2	2	IC UDN 2841	1555	3	4	Screw 4 - 40x3/8 RH
1123	1	1	IC 8048	1557	3	4	Lockwasher #4
1124	2	2	IC 9111A	1559	3	4	Hex Nut #4
1126	4	4	IC 74LS374	1560	1	0	Screw 6 - 32x3/8 RH
1129	1	1	IC 74LS04	1561	1		Lockwasher #6
1130	1	1	IC 74LS74	1571	1		Hex Nut #6
1131	1	1	IC 74LS32	1588	1	1	Heatsink
1133	1	1	IC LM 311	5010		1	Plate
1200	2	2	Transistor MPSA13	5012	1		Conn. Plate
1202	1	1	Transistor MPSU45	5104	1		Board
1203		1	Transistor 2N3904	5117		1	Board
1206	1	1	V. Regulator 7805	5150	1	1	Transformer

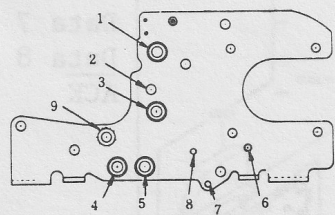
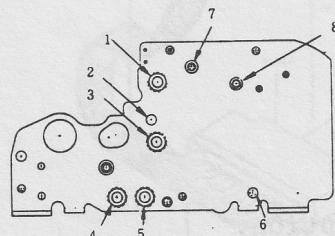
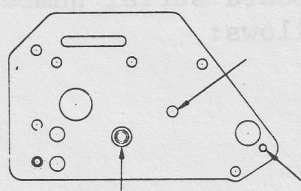
MOTOR CONTROL ASSEMBLY

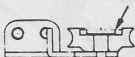
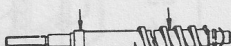
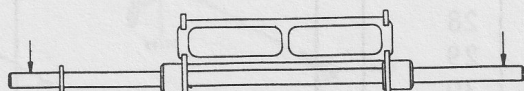
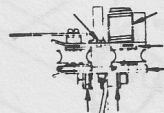
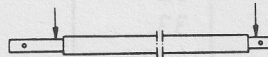
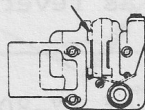
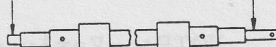

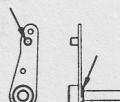
PART NO.	QTY 120 VAC	QTY 220/ 240 VAC	DESCRIPTION	PART NO.	QTY 120 VAC	QTY 220/ 240 VAC	DESCRIPTION
1000-102	1		Resistor 1K 1/4 W 5%	1043	1	3	Capacitor 2.2uF
1000-202		1	Resistor 2K 1/4 W 5%	1479	1	1	Connector 3-Pin Header
1000-301	1	1	Resistor 300 1/4 W 5%	1213	1	1	Triac
1025	1	2	Capacitor .1uF	1360	1	1	Reed Relay
1024	1	1	Capacitor .01uF	1300	1	1	Diode IN 4148

Lubrication table (D-1 to D-20)

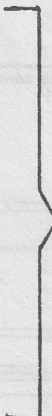
- * Use only Losoid 33 for oiling purposes.
- * Lubricate after the parts are cleaned.
- * Do not lubricate the guide rail (07120), the guide roller assembly (0115A), the surface of the ground roller (0420) or the ball bearing.

D-4 Advance cam unit 	D-5 Cam lever unit 
D-6 Print coil lever unit 	D-8 Advance lever (B) unit 
D-7 Paper advance ratchet wheel 	D-10 Ground roller unit 
D-9 Ratchet holding pawl unit 	D-12 Clutch indent gear unit 
D-11 Clutch lever unit 	

D-1 Left end plate unit 
D-2 Right end plate unit 
D-3 Auxiliary endplate unit 

D-13 Return spring roller unit 	D-15 Advance screw 
14 Actuator armature unit 	
D-16 Pinhead block 	D-17 Clutch indent unit 
D-18 Idler unit 	D-19 Paper advance roller unit 
D-20 Idler unit 	D-20 Actuator lever unit 

INPUT CONNECTOR PIN OUT

PIN #	EX-801P (36 pin Amphenol 57 series)	EX-801S (DB-25S)	EX-801HS (DB-25S) EX-820HS	EX-820 (DB-25S)
1	STR	Chassis GND	Chassis GND	Chassis GND
2	Data 1	-	*	-
3	Data 2	RS232C IN	RS232C IN	RS232C IN
4	Data 3	-	*	-
5	Data 4	-	*	-
6	Data 5	-	-	-
7	Data 6	Signal GND	Signal GND	Signal GND
8	Data 7	-20mA	-20mA	-20mA
9	Data 8	+20mA	+20mA	+20mA
10	ACK	STR	-	STR
11	BSY	-	-	-
12	Off Line	-	-	-
13	-	+5V	+5V	+5V
14	GND	BSY	-	BSY
15	-	Data 1	-	Data 1
16	OV	Data 2	-	Data 2
17	Chassis GND	Data 3	-	Data 3
18	+5V	Data 4	-	Data 4
19		Data 5	-	Data 5
20		-	DTR (Overrun)	-
21		Data 6	-	Data 6
22		-	-	-
23		Data 7	-	Data 7
24		Data 8	-	Data 8
25		ACK	-	ACK
26				
27				
28				
29				
30				
31	-			
32	-			
33	GND			
34-36	-			

* Pins may be used as reverse channel with M2K option.

NOTE: Early models of EX-801/EX-820 with circuit board serial numbers 358 and below have current loop input as follows:

Pin 4 -20mA
Pin 5 +20mA

